

RESEARCH ON SPECTROSCOPY, OPACITY, AND ATMOSPHERES

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Principal Investigator

Dr. Robert L. Kurucz

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**Smithsonian Institution
Astrophysical Observatory
Cambridge, Massachusetts 02138**

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**The NASA Technical Officer for this Grant is Dr. Donald West, Code: 684.1, NASA
Goddard Space Flight Center, Greenbelt, MD 20771.**

With this funding I produced a web site kurucz.harvard.edu that can also be accessed by FTP. It has a 73GB disk that holds all of my atomic and diatomic molecular data, my tables of distribution function opacities, my grids of model atmospheres, colors, fluxes, etc, my programs that are ready for distribution, and most of my recent papers. Atlases and computed spectra will be added as they are completed. New atomic and molecular calculations will be added as they are completed.

I got my atomic programs that had been running on a Cray at the San Diego Supercomputer Center to run on my Vaxes and Alpha. I started with Ni and Co because there were new laboratory analyses that included the five isotopic components for Ni and hyperfine splitting for Co. The Ni and Co components now produce profiles that can match the observed solar spectrum.

I now have enough memory in my Alpha to treat 3000 x 3000 matrices. I include all levels up through $n=9$ for Fe I and II, the spectra for which the most information is available. A surprising finding is that quadrupole transitions have been grossly in error because mixing with higher levels has not been included in the past. After working on Fe I and Fe II, other spectra seem "easy", and I can do mass production.

ATLAS12, my opacity sampling program for computing models with arbitrary abundances, has been put on the web server.

I wrote a new distribution function opacity program for workstations that replaces the one I used on the Cray at the San Diego Supercomputer Center. Each set of abundances would take 100 Cray hours costing \$100,000, and I ran 25 cases. Each of my opacity CDs contains three abundances. I have the new program running on the Alpha and it takes about a week. I am going to have to get a faster processor or I will have to dedicate a whole workstation just to opacities.

I had some distractions that slowed down my work on computing atomic line lists. I got tapes of TiO and H₂O line data from David Schwenke at Ames. I reformatted the data for use in my stellar atmospheres programs and issued them on Kurucz CD-ROMs 24, 25, and 26. The files are also on my web site. I also added collision induced opacity for H₂-H₂ and H₂-He from Borosow. My programs can now produce fairly realistic models and spectra for M stars. Recently I obtained the H₃⁺ line list from Tennyson at University College London and I am putting into my format.

Another distraction is that I got my old Cray non-LTE spectrum synthesis program running on my workstation. It uses departure coefficients from a pre-existing non-LTE model atmosphere to generate a line source function for each line. I use it to compare my line data to FUSE and solar spectra in the far ultraviolet. I also include more than 8000 lines in coronal approximation and can work down to the soft x-ray region.

